

Claims

- 1 **1.** Method for recognizing speech, comprising the steps of
- receiving a speech phrase;
 - generating a signal being representative to said speech phrase;
 - pre-processing and storing said signal with respect to a determined set of
- 5 rules;
- generating from said pre-processed signal at least one series of hypothesis speech elements;
 - determining at least one series of words being most probable to correspond to said speech phrase by
- 10 - applying a predefined language model to at least said series of hypothesis speech elements,
- wherein the step of determining said series of words further comprises the steps of:
- at first determining at least one sub-word, word or a combination of words
- 15 most probably being contained as a seed sub-phrase in said received speech phrase;
- then continuing determining words or combinations of words and which are consistent with said seed sub-phrase as at least a first successive sub-phrase which is contained in said received speech phrase by using and evaluating ad-
- 20 ditional and paired and/or higher order information between the sub-phrases, thereby decreasing the burden of searching.
- 2.** Method according to claim 1, **characterized in that** a predefined language model is applied to at least said series of hypothesis speech elements to
- 25 obtain said seed sub-phrase and
- said additional and paired and/or higher order information is obtained from said language model.
- 3.** Method according to any of the preceding claims, **characterized in that**
- 30 as additional information within that language model semantic and/or pragmatic information or the like between the sub-phrases is used.
- 4.** Method according to any of the preceding claims, **characterized in that** additional information within said language model is used being descriptive for the prepositional relationship of the sub-phrases.

- 1 5. Method according to any of the preceding claims, **characterized in that** additional information within that language model is used being descriptive for pairs, triples and/or higher order n-tuples of sub-phrases.
- 5 6. Method according to any of the preceding claims, **characterized in that** a language model is used containing at least a recognition grammar built up by at least a low-perplexity part and a high-perplexity part, each of which being representative for distinct low- and high-perplexity classes of speech elements.
- 10 7. Method according to claim 6, **characterized in that** word classes are used as classes for speech elements or fragments.
8. Method according to any preceding claims, **characterized in that** a language model is used containing a low-perplexity recognition grammar being ob-
15 tained from a conventional recognition grammar by
- identifying and extracting word classes of high-perplexity from the conventional grammar,
- generating a phonetic, phonemic and/or syllabic description of the high-perplexity word classes, in particular by applying a sub-word-unit grammar compiler to them, to produce a sub-word-unit grammar for each high-perplexity
20 word class and
- merging the sub-word-unit grammars with the remaining low-perplexity part of the conventional grammar to yield said low-perplexity recognition grammar.
- 25 9. Method according to any of the preceding claims, **characterized in that** a hypothetic graph is generated for the received speech phrase including the generated sub-phrases and/or their combinations as candidates for the recognized speech phrase and
that additional information between the sub-phrases is used to constrain and
30 to restrict the search for the most probable candidate within the graph.
10. Method according to claim 9, **characterized in that** during the search candidate sub-phrases or sub-words from the high-perplexity word classes are inserted into the hypothesis graph, whereby the sub-word unit grammars for
35 the high-perplexity word classes are used as constraints as well as the respective additional semantic and/or pragmatic information.

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5 12. Method according to any of the preceding claims, **characterized in that** the vocabulary - in particular of said language model - applicable for the remaining parts of the speech phrase besides the seed sub-phrase is restricted at least for one remaining part, so as to decrease the burden of search.

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Table 1. Demographic characteristics of the study population	
Age (years)	65.2 (SD 10.5)
Gender	
Male	55.2%
Female	44.8%
Education (years)	12.5 (SD 3.2)
Marital status	
Married	68.5%
Widowed	21.3%
Divorced	8.7%
Single	1.5%
Income (USD/month)	1,250 (SD 450)
Health status	
Good	72.1%
Fair	18.9%
Poor	9.0%